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MATHEMATICS.—*A trigonometric computer.* F. E. WRIGHT, Geophysical Laboratory, Carnegie Institution of Washington.

The solution of spherical triangles by the logarithmic computation of trigonometric formulas is at best a time-consuming process, especially if there be many such triangles to solve. In case high precision is required no other method is available; but if only approximate results are desired, graphical methods may be used, such as an exact projection net; of these the stereographic net published by G. W. Littlehales[1] is the most accurate and furnishes results correct to about 2′ of arc under favorable conditions. If the results are to be correct within one-half minute of arc graphical methods are not adequate and recourse must be had either to computation or to some mechanical device of high precision.

In crystallographic work the degree of precision is of the order of magnitude of $^1/_2'$. In the measurement of the changes in

[1] *Altitude, azimuth, and geographical position.* J. B. Lippincott Company. Philadelphia, 1906.

crystal angles with temperature the position of each crystal face is determined on the two-circle goniometer by means of two angles (polar distance and azimuth). Having given the position-angles of any two faces, the angle between them can be found by the solution of a spherical triangle.

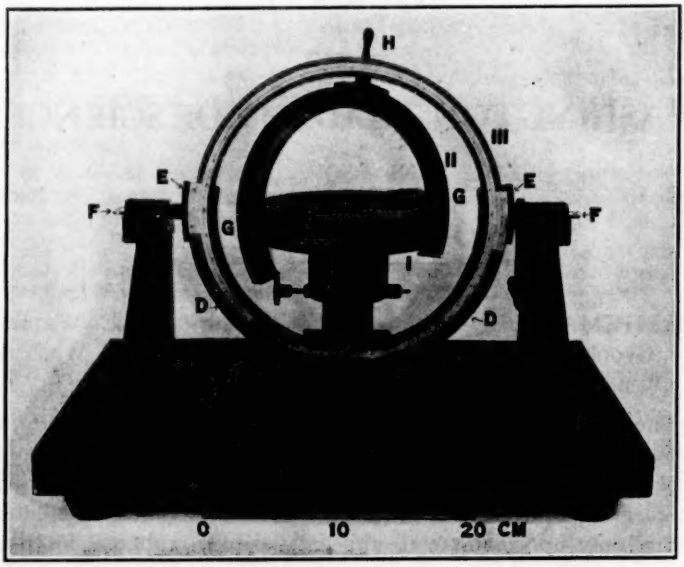

Fig. 1. Photograph of trigonometric computer.

In 1913 the writer had occasion to solve many triangles of this type, and to save time had a mechanical computer constructed in the instrument shop of the Geophysical Laboratory. This instrument has proved to be satisfactory in practice for the solution of oblique spherical triangles in which three of the angles are given and the value of any one of the three remaining angles is sought with a precision of about half a minute. The computer was designed for, and functions best in, the solution of the

problem: given two sides and the included angle of a spherical triangle; find the third side.

Description of instrument.—A photograph of the instrument is reproduced in fig. 1. It consists essentially of three concentric graduated circles which can be inclined at different angles one to the other. The inner circle I is horizontal and can be rotated about a vertical axis. The outer circle III fits in the semicircular groove *D* and is free to turn in this bearing, the angle of turning being read off on the vernier at *E*, *E;* the circle in its bearing can also be rotated about the horizontal axis *F*, *F*. The intermediate circle II is not a complete circle and is attached to the circle I by the horizontal axis *G*, *G*, and to the circle III by the axis *H*. The angles of rotation and revolution of these circles can be read off on appropriate verniers. The circles are equipped with clamp screws and slow-motion devices for the accurate setting of angles.

The following steps are taken to solve the problem: given two sides *a*, *b*, and the included angle *C* of a spherical triangle; desired the third side *c*.

Set the three circles at right angles to each other—all verniers reading 90°. Turn circle III about the horizontal axis to the position where it includes the angle *C* with the horizontal circle I (angle read off on the vernier of circle II). Turn circle II in its bearing until axis *H* includes an angle *a* with the axis *F*, *F;* turn horizontal circle I about its axis until axis *G*, *G* includes the angle *b* with the axis *H*. The angle *H-G* is then the desired angle *c*. The entire operation requires about one minute and is simple and readily checked.

The instrument is necessarily one of high precision, and first class workmanship is required to produce a satisfactory computer. In its construction care was taken to include adequate adjustment facilities such that the instrument can be readily adjusted in case of wear. The instrument is mounted on a heavy cast-iron base. Credit is due to Mr. J. Jost of the mechanical staff of the Laboratory for the excellent mechanical workmanship on this computer.

BOTANY.—*The Venezuelan mahogany, a hitherto undescribed species of the genus* Swietenia. H. PITTIER, Bureau of Plant Industry.

It is interesting to note how many groups of trees well known for their industrial or other economic uses have thus far escaped the attention of botanists. This is especially true in the case of tropical woods, and the principal reason seems to be that collectors, taking it for granted that plants universally used by man are too well known to deserve critical study, seldom secure the herbarium material which is indispensable for their proper botanical identification.

Among many examples of this kind may be mentioned the Venezuelan mahogany, a stately tree which is rather abundant in the basal region of Venezuela, from sea-level up to about 1,000 meters. Besides being extensively used locally, it has for some time been exported to Europe and the United States. The only attempt at its scientific classification was that of Dr. A. Ernst, who in 1883, inh is report on the Venezuelan National Exposition, considered it identical with the Santo Domingo mahogany (*Swietenia Mahagoni* L.). From this species, however, it differs widely in the size and dehiscence of the fruit, the size, shape, and texture of the leaflets, and the details of the flower structure.

Since 1913, when for the first time I had an opportunity to observe this tree *in situ*, I have been able to study it over an extensive territory. From the first it seemed to me specifically distinct from the real mahogany, of which several individuals, grown from seeds brought directly from Santo Domingo, are to be seen in the vicinity of Caracas. I was struck principally by the dimension of the capsules and by their mode of dehiscence. Heretofore the basal dehiscence noted in the true mahogany has been considered one of the diagnostic characters of the genus. In the Venezuelan species, however, the capsules open as often from the apex as from the base, and I have noticed that such is the case also with *S. macrophylla*, which I have had occasion to observe in Panama.

After my first trip to Venezuela the above observations were reported to the then best recognized authority on the family Meliaceae, Casimir de Candolle, whose death science has lately had to lament. Mr. de Candolle's views confirmed mine. In a letter he referred to the necessity of revising the generic definition of *Swietenia* as to the mode of dehiscence of the capsule, and expressed his intention of describing the Venezuelan species as new. This he seems not to have been able to do, for which reason I now proceed to give my own description, dedicating the species to the memory of that illustrious botanist, whose friendship I am proud to have enjoyed for nearly forty years.

Swietenia Candollei Pittier, sp. nov.

A tree up to 40 meters high, the trunk erect, 120 cm. in diameter at the base, covered with rimose bark, the crown more or less elongate-ovoid. Leaves abruptly pinnate, glabrous, the rachis 15 to 22 cm. long, terete, slender, the petiolar part 7 to 8.5 cm. long; leaflets 3- or 4-jugate, opposite, subcoriaceous, inequilateral, the petiolules slender, canaliculate, 6 to 12 mm. long, the blades ovate to elliptic-lanceolate, acute or subacute at the base, long and narrowly cuspidate at the apex, 4 to 11 cm. long, 2 to 4 cm. broad, shining above, dull and paler beneath.

Inflorescence axillary, entirely glabrous, 10 to 15 cm. long, the peduncles 5 to 6 cm. long, the flowers pediceled, yellowish white, the bractlets minute, caducous; pedicels 3 to 6 mm. long, slender, erect; calyx short, cupular, the 5 lobes ovate-rounded, obtuse; petals (imbricate in bud) inequilateral, obovate, obtuse, 5 to 6.5 mm. long, about 3 mm. broad, reflexed in anthesis; stamen tube tubular-urceolate, 4 mm. long, the teeth narrow and acuminate, the anthers subsessile, ovoid-oblong; disk crenulate, 0.8 mm. high; pistil about 4.5 mm. high, glabrous, the ovary ovoid, the style rather slender, the stigma discoid, 1.5 mm. in diameter, entirely exserted from the stamen tube at full anthesis.

Fruiting peduncles 10 to 24 cm. long; capsule distinctly obpyriform, 13 to 14 cm. long, 8 to 9 cm. in diameter, pale brown outside, with a rugose surface; valves 5, opening mostly from top to base, ligneous, 7 to 8 mm. thick, with a white inner coating adhering loosely to the seeds; central column about 11 cm. long, club-shaped and 5-winged, light and spongy; cells 5, provided at the top with a double series of spongy, dark brown scales, the 9 to 12 perfect seeds inserted on these by a hilum at the apex of the wing, 2 to 4 of the upper seeds being generally undeveloped and imperfect; wing basal, about 7 cm. long and 2.5 cm. broad, papyraceous, thicker on the outer margin, two fibro-vascular bundles here connecting with the hilum; body of the seed more or less flattened, rounded at the tip, about 2.4 cm. long, 1.5 cm. broad, 5 to 8 mm. thick, entirely smooth and of a rich brown color,

with an agreeable odor when fresh; embryo 2 cm. long, 1.2 cm. broad, flattened, yellowish white, with a dark umbilical area on the outer thicker margin.

Type in the U. S. National Herbarium, no. 601496, collected at La Trinidad de Maracay, State of Aragua, Venezuela, at an altitude of about 440 meters, in flower, January 31, 1913, by H. Pittier (no. 5789).

The purpose of the spongy suberose tissue surrounding the embryo is to store moisture for the promotion of germination.

To my knowledge, *Swietenia Candollei* is spread in the basal region all over the coastal range of Venezuela and in the interior valleys north of the llanos. A tree which is presumably this species is reported to exist in the Orinoco Valley also, and along the foot of the Andes in the region of Lake Maracaibo, but until we have specimens it is not possible to affirm that there is but a single species in these regions. Several other timber trees belonging to diverse genera are in the local market under the name *caoba*, which is the Spanish equivalent for mahogany.

The Venezuelan mahogany is often seen along streets and in parks, as for instance in Valencia, in the State of Carabobo. It is used also for shade or as a windbreak in cacao plantations and in former times was planted extensively in the live hedges bounding the sections of the larger estates. It strikes root readily from stakes and, as it has proven profitable in the past, ought to be propagated now, because of its economic value.

BIOLOGY.—*The Bioclimatic Law.*[1] ANDREW D. HOPKINS, Bureau of Entomology.

In 1718 Dr. Jacob Bigelow, who was then Rumford professor and lecturer on *materia medica* and botany in Harvard University, published a paper[2] based on evidence secured from the reported dates of the blooming of the peach tree at different places between Montreal, Canada, and Fort Clairborne in Alabama Territory. In this paper Dr. Bigelow suggested that the difference in the time of the event between the northern and southern extremes of the country was not less than two months and a half. This suggestion served to stimulate further studies along this line by botanists in Europe and especially in Germany, and finally led to the founding of the science of periodical phenomena under the designation of Phenology.

[1] Read before the Biological Society of Washington, November 29, 1919.

[2] Memoirs Amer. Acad. Arts and Sciences 4, Part I.

For a time the study related to plants alone and thus was associated with botany. Later, animals, and still later, the relation of periodical phenomena of plants and animals to climate, were included, and from the first, variation in the time of occurrence of periodical phenomena with geographical position was recognized. Thus the science is founded on and embraces certain features of biology, climatology, and geography, and involves, in the consideration of its problems, a number of other branches of science and practice.

Beginning about 1830, special attention was given by German writers to a study, first of the rate of variation with latitude, and later to the variation with altitude, and finally, in 1893, the discovery was announced of a rate of variation with longitude.

In 1894 the writer noted that the dates of emergence of the periodical cicada in West Virginia varied with the latitude and altitude. This, in connection with the announcement by Dr. Merriam of the relation of climate and temperature to the defining of equal or similar biological associations, designated as life zones, led to a consideration of the relation within the State of West Virginia of insect and plant distribution to periodical activities, temperature, latitude, and altitude. About this time the Hessian fly was very destructive to wheat throughout the State and, guided by the findings of Professor Webster that in Ohio there was a difference in safe dates to sow wheat to avoid damage by this insect, varying with latitude north and south of Wostor, an effort was made by the writer to apply the principle in West Virginia. It was soon found that altitude was equally as important as latitude, and a detailed study of this new phase of the problem, aided by phenological observations at different latitudes and altitudes, resulted in the publication in 1895 of Bulletin 67 of the West Virginia University, Agricultural Experiment Station, in which it was suggested that the rate of variation in the safe dates for seeding wheat was about one day for fifteen minutes of latitude and one hundred feet of altitude. It was further suggested that this rate of variation was in accordance with natural law, which could be applied in designating the time of periodical events or practice for any given place in the

State. As an example, and to serve as a guide to the selection of the time to sow wheat at different latitudes and altitudes to avoid damage by the fly, a calendar of dates and altitudes was prepared and issued with the bulletin, to be used in connection with a map of the State. By means of this map-calendar the average safe date for any place could be determined by the farmer. The practical value of this method was recognized, and demonstrated in the greatly lessened loss from Hessian fly damage the following year (1896) and even to the present time.

Up to the time the bulletin was published and some years later the determination by the writer as to the rates of variation in time with variations in latitude and altitude was entirely independent of the German literature on the subject, yet the conclusions were practically identical with those published many years before.

Recognizing the broad application of a knowledge of the suggested law to science and practice in entomology, general biology, climatology, and agriculture, the writer has given special attention to the subject during the past 24 years, as applied more specifically to forest entomology.

As a result of these studies new facts and evidence have accumulated which serve to establish a definite interrelation of organisms with climate and geographical position which we have designated as the *Bioclimatic Law*.

The basic principle in the operation of this law is found in the character of the responses of the organisms to the complex elements and factors of its local and immediate environment. In other words, the organism is utilized as the instrument by which the climate of a place and other influences on its activities are determined and the rate of variation in the dates of events and in latitude and altitude limits of distribution is measured. This method of studying the relations between life and climate has the advantage over that based on artificial instruments designed to record temperature, barometric pressure, humidity, sunshine, rain, wind, etc., because the organism not only records the influence of all of these, but that of all other elements, factors, and forces which affect life activity and which no instruments yet invented can record.

It appears that, in general, all organisms that are adapted to a given environmental influence respond to such influence in like manner. Therefore single species or groups of species of animals and plants can be utilized to interpret and measure the character and intensity of the controlling influences of a place or region. As sources of evidence and facts for the study of the broader phases of the problem of responses of organisms in general to the controlling influences of the local environment and regional climate, it has been found that plants, and especially trees and hardy shrub species, are the most convenient and reliable.

HOW THE PLANT RECORDS AND MEASURES THE INTENSITY OF THE CONTROLLING INFLUENCES

Trees and shrubs record the intensity of the influences which affect their life processes by means of more or less distinct events in their periods of activity and rest. In the humid climate of the north temperate zones the beginning of the period of activity is simultaneous with the advent of the spring season, in the South in February, and progressively later northward into June. This response is manifested by the swelling and opening of the winter leaf and flower buds, followed by successive events during the seasons of maximum and minimum activities such as the unfolding of the leaves, opening of the flowers, first leaves full grown, full foliage, winter buds forming, fruit forming, ripening or falling, autumnal coloring of the foliage, etc. Each event in each individual of a species marks both a stage in the development of the life processes and the advance of the season as related to the controlling influences of the locality or region.

Variations in the date of a periodical event from a given norm or constant are a measure, in terms of time, of the intensity of the controlling influences and forces as related (*a*) to geographical position, (*b*) to the season, (*c*) to the inherent tendency of species under the same external influences to vary towards early and late individual responses, and (*d*) to early and late responses of individuals of the same variety under varying local influences. The variation from a constant in the date of an event also measures the intensity of the controlling influences in terms of dis-

tance as related to feet of altitude or equivalents in degrees of latitude or longitude.

Studies in the application of these principles show quite conclusively that the responses to the controlling influences and forces are in accordance with natural law, in that (*a*) the time of occurrence of a given periodical event in the seasonal activity, or (*b*) the latitude limits of distribution of an organism, or (*c*) its altitude limits, are determined primarily by geographical position. Therefore, *other things being equal*, the variation between two or more geographical positions bears the same proportion to the distance between them, that 4 days of time bears to 1 degree of latitude, 400 feet of altitude, or 5 degrees of longitude. These coordinates of the law and their relations one to another are shown in table 1.

TABLE I. COORDINATES OF THE BIOCLIMATIC LAW

Geographical coordinates	Geographical unit coordinates	Time in day coordinate	Distance in feet coordinate
Latitude	1°	4	400
Altitude	400 ft.	4	400
Longitude	5°	4	400

APPLICATION OF THE LAW

The fundamental principle in the application of the law to research and practice is that which relates to variations from a constant.[3]

In the law as outlined the variation from the base should be at the rates mentioned. Therefore, on the basis of equal influence other than that related to geographical position, it is a simple mathematical problem to compute from the records at one place, the date, limit, or temperature *constant* for any other place. We know, however, that the *other* controlling influences are rarely, if ever, equal at two or more places and that, therefore, we must expect a greater or less variation from the constants.

[3] The constants of the law are the dates and the altitude and latitude limits that are computed from the records at a given base for any geographical position.

Thus the fundamental question to be answered is, what amount of variation from the constant in terms of days, feet, or degrees of distance, are we to expect for the varying local and regional influences which contribute to earlier or later dates, or higher or lower altitude.

During recent years special efforts have been made to find a reliable basis for answering this question. The first clue towards the answer was obtained from a study of over 40,000 reported dates of the beginning of wheat harvest, within the range of winter wheat culture in the United States. The results showed that the variations from the date constants, for all of the geographical units involved,[4] were in the same directions in certain regions of the country.

Throughout the Mississippi Basin from the Great Lakes southward, the reported dates were universally + or later than the computed constants; throughout the Great Plains, Rocky Mountain Plateau and part of the Great Basin, the reported dates were —, or earlier; throughout the Pacific Slope they were later; and so on. These results were strikingly significant of prevailing influences towards the acceleration in some regions and retardation in others of periodical phenomena as compared with the time-constant of the law.

Continued investigations along this line involved a detailed study of the altitude limits of species and of biological associations of plants and animals as mapped by the federal and state biological surveys and determined in a number of cases by personal investigations. The results of these later studies served not only to verify the evidence furnished by the wheat harvest records but to establish, as a general principle, the approximate amount of variation we may expect to find in all regions, from those in which there is no perceptible retarding or accelerating influence to those where the intensity of the influences reaches its maximum. As measured in time the variation from the constants is found to range from one to forty, with a maximum of fifty days at certain points along the Pacific Coast. As measured in altitude the variations are from 100 to 3000, with a

[4] Quadrangle $1/4 \times 1$ degree, and the average altitude.

maximum of 5000 feet. In these departures the earlier dates and higher altitudes are the result of accelerating influences, and later dates and lower altitudes are due to retarding influences.

In order to gather further facts and evidence on the variations from the constant and also the rate of advance of the spring season, as revealed by periodical phenomena, observations were begun at Brownsville in southeastern Texas and at Palm Beach and Miami, Florida, in February of the present year (1919). These were continued along routes from Brownsville in a general northeastward direction to the northern borders of the States of New York, Vermont, and Maine and to above the timberline on Mount Washington, from Miami north along the Atlantic Coast to Washington and from Palm Beach across the Florida Peninsula to Ft. Wayne, then north to Lake City and west to Pensacola, and return to Washington by the way of Birmingham, Alabama, Atlanta, Georgia, and Charlotte, North Carolina. These routes involved a travel, principally by rail, by Messrs. Griffith, Craighead, Snyder, and the writer, of over 20,000 miles and the recording of over 20,000 observations. The data accumulated by these investigations has served not only to verify the facts and evidence furnished by the wheat harvest and altitude limit data but has contributed information towards the solving of many other problems of scientific and economic interest, relating to the application of the law in research and practice, which I hope to discuss in future papers before this and other societies of Washington.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the Editors. The abstracts should conform in length and general style to those appearing in this issue.

APPARATUS.—*Potentiometers for thermoelement work.* WALTER P. WHITE. Bull. Amer. Inst. Min. Met. Eng. 1763–1772. Sept., 1919.

Thermocouple pyrometers are read in three ways. First, by direct readers where the current, and therefore the deflection, is proportional to the electromotive force of the couple; second, by potentiometers where the galvanometer merely helps to balance the electromotive force of the couple against that of a standard cell by means of known resistances and a constant battery-current; third, by intermediate instruments such as the pyrovolter, employing the potentiometer principle with a constant battery, but avoiding the standard cell, and measuring current with a calibrated galvanometer. Similar in result, but different in principle, is the new Harrison-Foote instrument, where the circuit resistance can be very quickly adjusted to the correct value. All these special instruments avoid the main difficulty of a direct reader, namely, the error from uncertain or variable resistance. It is necessary to use the regular potentiometer in order to avoid also the uncertainty (perhaps 1 per mille) of the calibration of the direct reader. With a slide-wire a simple and portable potentiometer is made, good to about 10 microvolts, or 0.25° with most thermocouples. The slide-wire also permits readings to 1 microvolt, though not altogether satisfactorily. Two special designs of potentiometer, the Diesselhorst-Wolff and the White, enable readings to be made to 0.1 microvolt or better, and the White potentiometer is very little affected by corrosive gases. Both these are deflection potentiometers, enabling part of the readings to be taken direct from the galvanometer with a gain in speed and without sensible error. If the potentiometer is arranged as a

double potentiometer, speed can be still further gained in reading different instruments simultaneously. The precision of these potentiometers exceeds that needed in ordinary pyrometry, but is useful in fundamental standardization work, in calorimetry, and in numerous other applications of the thermoelement. W. P. W.

PHYSICS.—*A standardized method for the determination of solidification points, especially of naphthalene and paraffin.* R. M. WILHELM and J. L. FINKELSTEIN. Bur. Standard Sci. Paper **340**. Pp. 12, figs. 4. 1919.

This paper, after a brief treatment of the definitions of melting and freezing points both of pure substances and of mixtures, describes a method of making solidification-point determinations of naphthalene. This method was recommended at a conference of Bureau of Standards and U. S. Customs officials, and is based on the well-known cooling curve or constant temperature method. The method is shown to be applicable to the determination of the freezing points of paraffin and other substances. R. M. W.

PHYSICS.—*Standardization of the sulphur boiling point.* E. F. MUELLER and H. A. BURGESS. Bur. Standards Sci. Paper **339**. Pp. 21, pls. 2, figs. 2. 1919.

This paper describes experiments made to complete the data which are required for the standardization of the sulfur boiling point as a thermometric fixed point. The precision attainable in calibration of resistance thermometers at the sulfur boiling point is so much higher than the accuracy of the gas thermometer determinations of the temperature that it was considered desirable to standardize the temperature corresponding to normal atmospheric pressure by definition at 444.60°, and the data from which this figure was deduced are given. The relation between the vapor pressure of sulfur and the temperature, over the pressure range from 700 to 800 mm., was determined with a precision of 0.01° or better. The result of this work is the formula

$$t = 444.60° + 0.0910(p\text{-}760) - 0.000049(p\text{-}760)^2$$

where t is the temperature in Centigrade degrees, assumed by a properly shielded resistance thermometer in the standard form of sulfur boiling apparatus, and p is the pressure, expressed in equivalent millimeters of mercury at 0° and under standard gravity (g = 980.665). In an appendix are given the specifications for a proposed standardization of the sulfur boiling point. E. F. M.

PHYSICS.—*Tables and curves for use in measuring temperatures with thermocouples.* LEASON H. ADAMS. Bull. Amer. Inst. Min. Met. Eng. 2111–2124. Sept., 1919.

Previous publications have called attention to the advantages of standard calibration tables for translating the electromotive force of a thermocouple into temperature, and such standard tables have been given for copper-constantan and for platinum-platinrhodium couples. It has now been found advisable to extend the range of the copper-constantan table so that this couple may be available for measuring temperatures up to 400° and down to —200° C. A table for chromel-alumel (the Hoskins couple) has also been worked out and the previous platinum-platinrhodium table for temperatures between 0° and 1755° is reprinted without change. The question of fixed-junction corrections is discussed and the best methods for making such corrections are described in detail. L. H. A.

PHYSICS.—*Spectral photoelectric sensitivity of silver sulphide and several other substances.* W. W. COBLENTZ and H. KAHLER. Bur. Standards Sci. Paper **344.** Pp. 18, figs. 17. 1919.

This paper gives data on the change in the electrical resistance of the sulphides of silver and of bismuth, when exposed to radiations of wave-lengths extending from 0.6μ to 3μ. Measurements were made also upon galena, cylindrite, pyrite, and jamesonite, which, however, did not show photoelectrical sensitivity for the highest spectral radiation intensities available.

Both the natural mineral, acanthite, Ag_2S, and a laboratory preparation were examined. The latter material, which was hammered into a thin plate, was found insensitive photoelectrically, at room temperature. But at —157° C. a sharp maximum of photoelectrical sensitivity was observed for radiations of wave-length $\lambda = 1.05\mu$.

Increasing the intensity of the exciting radiations shifts the maximum of the photoelectrical sensitivity curve toward the long wave-lengths.

There is no simple law governing the variation in the photoelectric response in silver sulphide with variation in intensity of the radiation stimulus. Mechanical working (hammering into a thin plate) appears to lower the intrinsic photoelectrical sensitivity of acanthite and changes the position of the maximum of spectral sensitivity. A spectral photoelectric sensitivity curve of bismuthinite, Bi_2S_3, was obtained at —166° C. There are maxima of sensitivity at 0.64μ, and 1.08μ, respectively. W. W. C.

SPECTROSCOPY.—*Measurement of wave-lengths in the spectra of krypton and xenon.* PAUL W. MERRILL. Bur. Standards Sci. Paper **345**. Pp. 6, pl. 1. 1919.

This paper records photographic measurements of wave-lengths in the spectra of krypton and xenon, principally in the red and infra-red.

In krypton 37 new lines were measured between 6576 A and 8928 A, and in xenon 52 new lines between 6318 A and 9162 A. In this region there are numerous strong lines which are probably among the most important in the spectra of these elements. Notable among these are xenon lines at 8231 and 8280. These and other lines may be of value as wave-length standards in the infra-red.

Attention is called to a probable analogy between the spectra of the rare gases neon, argon, krypton, and xenon which this investigation has brought to light. P. W. M.

INORGANIC CHEMISTRY.—*The relations between tridymite and cristobalite.* CLARENCE N. FENNER. Journ. Soc. Glass Technology **3**, Trans.: 116–125. Aug., 1919.

Several articles have appeared recently in French and British journals, in which some of the conclusions regarding the stability relations between the various forms of silica, published several years ago by the author, have been questioned. The principal basis for doubt seems to the present writer to be not that new evidence has been discovered, but that the observers have failed to take fully into consideration the rather remarkable properties of silica, which tend to obscure stability relations and whose effect was discussed in some detail in the article cited; moreover, that some of the evidence set forth there has been overlooked or disregarded, and explanations have been advanced which are inconsistent with this evidence. For this reason it has seemed well to take up the matter anew and present the evidence which bears upon the specific points involved. The points at issue are especially those which deal with the relations between tridymite and cristobalite. Certain evidence previously given is repeated in somewhat different form, and, to support it, further evidence is offered which either has not been given before in detail or is entirely new. In addition to the writer's work, other directly relevant information supplied by the work of Ferguson and Merwin on the system CaO–MgO–SiO_2 is cited in confirmation. All of the results are in accord with the con-

clusions previously announced, and it is believed that the explanations suggested by the foreign observers are directly at variance with the experimental evidence. The conclusion is reached, as before, that the field of stability of tridymite is limited by the temperature of 1470° ± 10°, and that at higher temperatures up to the fusing point cristobalite is the stable form. C. N. F.

ANALYTICAL CHEMISTRY.—*The rapid electrometric determination of iron in some optical glasses.* J. B. FERGUSON and J. C. HOSTETTER. Journ. Amer. Ceram. Soc. **2**: 608–621. Aug., 1919. (Geophysical Lab. Papers on Optical Glass, No. 16.)

The results of the application of the electrometric determination of iron with stannous chloride and potassium dichromate are discussed in this paper. The electrometric method enables one to make rapid and accurate analyses for both ferric and ferrous iron, provided interfering substances are absent. Under favorable conditions, such an analysis can be made in 10 minutes and may be carried out in glassware. Four different procedures are described for total iron and one for ferrous iron. A number of analytical results, including many ferrous-iron determinations, are given. The ferrous-iron content of the glasses proved to be dependent upon a number of factors and in some cases reached values in excess of 35 per cent of the total iron present. J. B. F.

ANALYTICAL CHEMISTRY.—*Determination of free carbon in rubber goods.* A. H. SMITH and S. W. EPSTEIN. Bur. Standards Techn. Paper **136**. Pp. 8. 1919.

After a brief review of the literature, a discussion is given of the difficulties encountered in the use of the nitric acid method. It is shown that nitric acid attacks the carbon and gives an insoluble compound, with the result that a factor of 1.05 must be used. An experiment is outlined which is taken to prove that bituminous matter is all removed by the treatment indicated. The effects of various mineral constituents are discussed and methods are outlined for their removal.

The authors conclude that, though the attack of nitric acid on carbon makes a very accurate determination impossible, the error caused thereby when the factor 1.05 is used is sufficiently small to justify the use of this method at the present time as a routine one in the rubber laboratory. S. W. E.

GEOLOGY AND PALEONTOLOGY.—*Contributions to the geology and paleontology of the West Indies.* Prepared under the direction of THOMAS WAYLAND VAUGHAN. Carnegie Institution of Washington, Publ. **291.** Pp. 184, pls. 53, figs. 8. 1919.

Contents:

Introduction. THOMAS WAYLAND VAUGHAN. Pp. 5–8.

1. *Tertiary calcareous algae from the islands of St. Bartholomew, Antigua and Anguilla.* MARSHALL A. HOWE. Pp. 9–19, pls. 6.

2. *Fossil foraminifera from the West Indies.* JOSEPH AUGUSTINE CUSHMAN. Pp. 21–71, pls. 15, figs. 8.

3. *Fossil bryozoa from the West Indies.* FERDINAND CANU and RAY S. BASSLER. Pp. 73–102, pls. 7.

4. *Tertiary mollusks from the Leeward Islands and Cuba.* CHARLES WYTHE COOKE. Pp. 103–156, pls. 16.

5. *West Indian Tertiary decapod crustaceans.* MARY J. RATHBUN. Pp. 157–184, pls. 9.

This series of memoirs, which has resulted from a minor grant made by the Carnegie Institution, presents data for the correlation of the different geologic events in the West Indies. The evidence furnished by all the classes of organisms studied is in accord. It is expected that this volume will be followed by others containing accounts of the fossil corals, the echini, the fossil and living land mollusks, and the stratigraphy and geologic history of the region.

1. Five species of coralline algae are described: 1 from the Eocene of St. Bartholomew, 3 from the Oligocene of Antigua, and 1 from the Oligocene of Anguilla.

2. The Foraminifera reported on are the Vaughan collection from the Leeward Islands, the Maury collection from Santo Domingo, the Johns Hopkins University collection from Bowden, Jamaica, and several lots from Cuba. The correlations indicated by the Foraminifera are discussed and 117 species are described or listed.

3. The Bryozoa described number 42 species; three of them are referred to new genera. The collections studied include representatives from the Oligocene of Antigua, Anguilla, and Panama and from the lower Miocene of Jamaica, Santo Domingo, and Costa Rica. The stratigraphic position and range of the species is tabulated.

4. In addition to 101 species of mollusks, including one new genus, from the Eocene, Oligocene, and Miocene of St. Bartholomew, Antigua, Anguilla, and Cuba, two new species of brachiopods from the Eocene of St. Bartholomew are described. The correlations of the formations are briefly discussed.

Since the completion of this paper, which was written early in 1917, the arbitrary boundary line between the Oligocene and the Miocene has been shifted a notch or two lower in the time scale, thus placing the La Cruz marl of Cuba, which had been regarded as Oligocene, on the Miocene side of the boundary. The fossils from the La Cruz marl are referred to the Oligocene instead of to the Miocene. This error is one of nomenclature, not of correlation.

The specimen from Anguilla figured on plate 2, fig. 3, and identified as *Orthaulax pugnax* (Heilprin) has proved, on further study, to be an undescribed species. Excellent specimens of the same species were recently obtained at several widely separated localities in Santo Domingo, and two fine casts come from the Island of St. Croix. As Miss C. J. Maury had described in manuscript an *Orthaulax* from Aguadilla, Porto Rico, which may be this species, I am refraining from giving my specimens a name until after her paper has been published.

5. The Crustacea studied are the Decapoda in the Vaughan collection from Anguilla and Antigua, the Gabb and Maury collections from Santo Domingo, and one specimen of doubtful origin. Thirty species are listed, but only 22 are specifically identified. Three new genera are described. C. WYTHE COOKE.

ANTHROPOLOGY.—*A structural and lexical comparison of the Tunica, Chitimacha, and Atakapa languages.* JOHN R. SWANTON. Bur. Amer. Ethnology, Bull. **68**. Pp. 56. 1919.

The Tunica, Chitimacha, and Atakapa languages were made the bases for the Tonikan, Chitimachan, and Attacapan linguistic families or "stocks" in the original classification of American languages north of Mexico by J. W. Powell. Even in Powell's time a reduction in the number of recognized stocks took place, and the process of reduction, or attempted reduction, had been markedly accentuated in recent years. The author believes he has adduced sufficient evidence in the present bulletin to prove the genetic relationship of the three languages considered. J. R. S.

ANTHROPOLOGY.—*Handbook of aboriginal American antiquities.* Part I: *Introductory, The lithic industries.* W. H. HOLMES. Bur. Amer. Ethnology, Bull. **60**. Pp. 380. 1919.

As explained by the author in his preface, "the present work forms one of the series of handbooks of the Bureau of American Ethnology, which was conceived as the natural and necessary outgrowth of the Handbook of American Indians (Bulletin 30), a comprehensive treatise

completed and sent to press while the writer was Chief of the Bureau."

The purposes of the present volume and the nature of its contents are also best given in his own words. "This work," he says, "is not designed as a formal presentation of American archeology in which the antiquities are described and discussed country by country, or region by region, in geographical sequence, but rather as a reference work or manual, the principal purpose of which is to assemble and present the antiquities of the continent in such a manner and order as to make them readily available to the student who shall undertake to present a comprehensive view of the evolution of culture among men.

"The present volume is, in large measure, introductory to the systematic presentation of the antiquities; it deals with the scope of archeologic science, the character, extent, and classification of its subject matter, the progress of research; with the several important problems which present themselves for solution, including those of race origin, migrations, culture evolution, and chronology; with the ethnic characterization areas; with the acquirement of the substances employed in the arts; and finally with the manipulation of stone.

"The second volume is to be devoted exclusively to the implements, utensils, and other minor artifacts of stone. These are given precedence over other grand divisions of the subject matter for the reason that they lie at the foundation of Stone Age culture, and, for that matter, at the foundation of all progress toward the civilized state, and at the same time are the chief reliance of the historian and chronologist who seeks to write the early chapters of the story of humanity. Additional volumes are expected to treat of all the remaining materials —mineral, animal, and vegetable—and it is further planned to give separate consideration to the more important arts and industries practiced by the native peoples, as building, sculpture, the textile and fictile arts, and metallurgy." J. R. SWANTON.

CHEMICAL TECHNOLOGY.—*Constant-temperature still head for light-oil fractionation.* FREDERICK M. WASHBURN. Bur. Standards Techn. Paper **140.** Pp. 12, figs. 4. 1919.

The three types of methods generally in use for the fractionation of light oil for the determination of benzene, toluene, and solvent naphtha are discussed. An apparatus which is an improvement on the dephlegmator of the Wilson and Roberts still is described, and the details of its operation are given. The apparatus is easily and inexpensively constructed, and requires no greater attention or time than others used.

Exceptionally large volumes of "pure" fractions are obtained which have a very small boiling-point range, showing that they contain only negligible amounts of impurities. Almost all of each of the components of the mixture distilled is obtained in practically the pure state, since the volumes of each of the intermediate fractions are only about 1.5 per cent of the volume taken for distillation. The composition of each of the intermediate fractions is actually determined, and the error introduced by this determination is small, since it is applied to only small volumes. The apparatus works well on mixtures containing widely varying percentages of benzene, toluene, and solvent naphtha.

F. M. W.

CERAMICS.—*Use of optical pyrometers for control of optical glass furnaces.* CLARENCE N. FENNER. Bull. Amer. Inst. Min. Met. Eng. 1001–1011. July, 1919. (Geophysical Lab. Papers on Optical Glass, No. 13.)

Among the features of careful control required in the manufacture of optical glass, that of the regulation of furnace temperatures is of high importance. It was found that the thermocouples generally in use did not come up to the requirements for rapid determination of temperatures, and it was thought that optical pyrometers should be a satisfactory substitute. Before adopting them for general use, tests were made to determine to what degree the requirements were satisfied. As a result, it was found that the manufacturer's calibration tables were considerably in error in some cases (which implies that they should always be checked), and that the luminosity of furnace-walls agrees satisfactorily with that of a "black body" under some conditions but departs very widely under others. The reason for these results and the factors upon which they depend are discussed. The manner in which the pyrometer is used under working conditions is described. The conclusion is reached that when the readings of the pyrometer are properly checked by such tests as these the instrument gives a very satisfactory and reliable means of controlling furnace temperatures.

C. N. F.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

GEOLOGICAL SOCIETY

339TH MEETING

The 339th meeting of the Geological Society of Washington was held in the Auditorium of the Cosmos Club on Wednesday evening, November 12, 1919. President E. O. ULRICH presided. The program was as follows:

REGINALD A. DALY: *Changes of land and ocean levels.*

Field study of the zones of post-Glacial emergence in the Gulf of St. Lawrence, along the New England coast, and in northwestern Europe has suggested two tentative conclusions bearing on general principles of geology. The first is that a world-wide (eustatic) sinking of ocean level to the extent of 20 to 25 feet seems to have occurred since the Wisconsin stage of the Glacial period. Secondly, certain field observations favor Jamieson's hypothesis that the sinking and rising of the earth's crust, due respectively to glacial loading and to unloading by deglaciation, have been accompanied, again respectively, by synchronous rising and sinking in the belt peripheral to the ice-caps; in other words, that these isostatic adjustments have been accomplished largely through viscous deformation of the earth, rather than by purely elastic deformation of the earth's radii.

The first suggestion has been strikingly enforced by facts recently ascertained in Florida and in the Samoan Islands, as well as by compilation of the published statements regarding "raised" beaches and allied forms along the shores of the United States, the Bahamas, Brazil, the British Isles, Australia, New Zealand, Pacific archipelagoes, and elsewhere.

Field evidence for the second suggestion has been secured chiefly on the Maine coast. There the condition of the shore zone emerged in post-Wisconsin time can best be explained by postulating uplift of the continental shelf during the Wisconsin stage, followed by resubsidence during the Recent isostatic rise of the glaciated region of the continent. If these synchronous movements were actually due to isostatic, viscous deformation of the earth's crust, similar movement might be expected in other parts of the belt peripheral to each ice-cap of the Pleistocene period. The corresponding test of the general hypothesis involves questions as to working of the abandoned shore-lines of Lake Passaic and of the Great Lakes; the origin of the submarine "channel" of the

Hudson River across the continental shelf; the origin of the "deeps" of the Susquehanna River; the cause or causes of many Pleistocene rearrangements of drainage in Pennsylvania, Ohio, West Virginia, Kentucky, and Nebraska. The relation of these problems to the general hypothesis may deserve discussion by the geologists who are most familiar with the different parts of this extra-glacial belt. Munthe's conclusion that Jamieson's hypothesis applies to Recent warpings in northwestern Europe is another strong reason for its serious consideration in the case of our own ice-cap area in eastern North America. Similarly, the reported warping of the highest shore-line of Glacial Lake Missoula (Montana-Idaho) and the problem of the Grand Coulee in Washington State may possibly indicate still a third ice-cap which deformed the earth's surface in the way Jamieson imagined.

The paper was discussed by several members of the Society.

340TH MEETING

The 340th meeting of the Society was held in the Auditorium of the Cosmos Club on Wednesday evening, November 26, 1919. The program consisted of the following three papers:

D. F. HEWETT: *The Heart Mountain overthrust near Cody, Wyoming.*

This overthrust, recognized west of Cody by Dake in 1916, proves to be much more extensive than was at first suspected. Work in the region in 1919 shows that on two of the four principal summits of McCulloch Peak (6,200 feet) 12 miles east of Cody, caps of Madison and Bighorn (?) limestone 20 to 80 feet thick rest on beds that yield Bridger fossils (Upper Eocene). As these residual masses of limestone lie 28 miles east of the westernmost exposures of the fault, this distance measures the minimum extent of the overthrust. Data collected to date do not yield conclusive evidence whether the overthrust took place before or after the deposition of the andesitic tuff and breccia that make up the Absaroka Mountains. The extent of the overthrust is therefore comparable with the Bannock in southeastern Idaho, the most extensive known in North America. The Bannock overthrust took place before the Wasatch (Lower Eocene) beds were laid down, whereas the Heart Mountain overthrust can not have occurred before the deposition of the Bridger (Upper Eocene) beds.

CLYDE P. ROSS: *Geology of the Lower Gila region, Arizona.*

The region described lies in southwestern Arizona between Gila and Colorado rivers, south of Buckskin Mountains and west of Phoenix. The rock formations are divided into four groups: (1) basal complex; (2) intrusives of probable Mesozoic age; (3) Tertiary lavas and sedimentary rocks; (4) Quaternary alluvium and basalt. The basal complex is divided into highly metamorphosed schists included in batholithic masses of granitic gneisses, a thick series of metamorphosed marine sediments unconformably overlying the gneisses, and a series of comparatively slightly metamorphosed marine sediments of possible Paleozoic age. The Tertiary lavas far exceed the sediments in amount, totalling over 2,000 feet in thickness. They are latites, soda rhyolites, and

similar rocks, with some basalts. The sedimentary rocks are, in part, of terrigenous origin and similar to those being deposited in the present valleys. There are also limestones containing indistinct fossils which were deposited in large bodies of brackish water which may have had connection with the sea through the Gulf of California. In the Quaternary, alluviation exceeded volcanism in importance. The sediments belong to three groups: (1) an older, disturbed and partly consolidated group; (2) a younger and only locally consolidated group; (3) the deposits of the present streams.

KIRK BRYAN: *Geology and physiography of the Papago country, Arizona.*

The Papago country is a large area in southwestern Arizona, lying south of Gila River and west of Santa Cruz River. Part of the results of a broad reconnaissance, covering nearly four square degrees, and made for the purpose of preparing a guide to routes of travel and watering-places in this desert region, was presented. The work was done in an automobile between September 4 and December 23, 1917. The speedometer mileage was 4,250 miles; logs for 1,920 miles of road were obtained; 240 photographs taken; and a topographic map containing much new geographic information, as well as a geologic map, were prepared.

The following broad generalizations can be made: (1) The mountains are not residual mountains in the old age stage of erosion, but the majority are fault block mountains in youth and maturity, or rejuvenated and resurrected mountains; (2) the valleys are with one exception drained and probably have never contained lakes.

Fifty-four of the sixty-eight mountain ranges and groups of hills in the area can be divided into three classes:

Class I consists of 21 mountain ranges composed in large part of alternating beds of lava, tuff, volcanic conglomerate and agglomerates, and stream-laid conglomerates, probably of Tertiary age. Two of these mountains are old volcanoes, 10 are rather simple fault-block and horst mountains, 11 are complexly faulted mountains and dissected plateaus with large or small masses of the underlying basal complex.

Class II consists of 17 mountain ranges composed largely of rocks of the Basal Series: granites, gneisses, quartzites, schists, and phyllites of pre-Cambrian age; felsites, both intrusive and extrusive, and granites of probable Mesozoic age; Paleozoic limestones; and Cretaceous sandstone and shales. While largely composed of rocks of the Basal Series, these mountains contain patches of lavas of Tertiary age tilted and dislocated and so disposed as to indicate that uplift followed the extrusion of the lava, and that the present mountains have been resurrected by the removal of a more or less continuous lava capping.

Class III consists of 14 mountain ranges composed wholly of rocks of the Basal Series, with no known association of Tertiary lavas. The mountains of this class approach most closely the prevailing conception of the mountains of the region as old age types. Two of them, however, the Estrella and Tinajas Altas mountains, have on their

east flanks upland valleys separated from the lower canyons by steep grades and falls. Such valleys have been considered by Davis adequate evidence of renewed uplift of a fault-block mountain. Other ranges may fall in this class solely because they have been inadequately explored.

The remaining mountains and groups of hills, fourteen in number, are so little known that they can not be classified. Of the sixty-eight ranges, forty-two are young, mature, rejuvenated or resurrected mountains.

The intermontane valleys are in part formed of plains cut in rock, but McGee's estimate of 50 per cent of rock surface is an over-statement. The Gila, Santa Cruz, and Altar valleys are dissected not only by ephemeral streams which cut the alluvial slopes leading from the mountains, but by the axial streams. In none of the sections of the alluvium exposed by this dissection have lake beds been found. The axial trenches of Santa Cruz and Altar valleys fade out before reaching Gila River, and the terraces of the upper parts of these valleys can not be directly correlated with the terraces of the Gila. The axial streams of the smaller desert valleys are not entrenched except near Gila River, and the centers of these valleys are broad plains of alluviation with, however, no evidence of extinct lakes. The upper parts of the alluvial slopes are, however, nearly always dissected. This peculiarly arranged terracing and dissection presents one of the knottiest problems in the physiography of southern Arizona. On the successful correlation of the several stages of dissection and alluviation of these valleys will depend the interpretation of Pleistocene history in the region. Solution of this problem will also throw light on the validity of climatic terraces.

341ST MEETING

The 341st meeting of the Society was held in the Auditorium of the Cosmos Club on Wednesday evening, December 10, 1919. Mr. M. R. CAMPBELL presided.

President E. O. ULRICH delivered the presidential address for 1919, entitled: *Major causes of land and sea oscillations.*

This paper will be published later in the JOURNAL of the ACADEMY.

After a recess, the twenty-seventh Annual Meeting was called to order by President ULRICH. The reports of the secretaries, treasurer, and auditing committee were read and accepted. The balloting on nominees for officers for 1920, proposed by the nominating committee, resulted as follows:

President, DAVID WHITE; *First Vice-President*, GEORGE W. STOSE; *Second Vice-President*, W. C. ALDEN; *Secretaries*, R. S. BASSLER, LAURENCE LA FORGE; *Treasurer*, GEORGE R. MANSFIELD; *Members-at-Large of the Council*, C. WYTHE COOKE, J. M. HILL, H. D. MISER, EUGENE STEBINGER, R. C. WELLS.

R. W. STONE, *Secretary.*

SCIENTIFIC NOTES AND NEWS

MATTERS OF SCIENTIFIC INTEREST IN CONGRESS[1]

The Senate and House adjourned *sine die* on November 19, and the Sixty-sixth Congress convened for the regular session on December 1, 1919.

The bill to provide for an international conference on international communication (H. R. 9822), which is expected to have to deal with many technical questions such as wireless wave-lengths, has progressed to final action. It was reported in the Senate without further amendment and passed December 8, and was signed by the President on December 17 as Public Law No. 100.

On December 6 Mr. SUTHERLAND introduced S. 3496: "To amend an Act entitled: 'An Act to provide compensation for employees of the United States suffering injuries while in the performance of their duties and for other purposes,' approved September 7, 1916." The importance of this legislation to the members of the scientific bureaus has been recently emphasized by the accidental death of Mr. E. C. MCKELVY in one of the laboratories of the Bureau of Standards.

The act which it is proposed to amend is Public Law No. 267, Sixty-fourth Congress. The amendments provide, in addition to minor changes in details, for an increase of fifty per cent in the maximum and minimum monthly compensation; continuation of payments to a widow for two years after her remarriage; more liberal terms of payment to dependent parents, brothers, sisters, or grandchildren; and an increase from $100 to $150 per month as the maximum salary on which compensation to dependents may be computed. New sections provide for: payment of compensation to the heirs of a beneficiary who dies before he has received the amount due him; vocational education of an employee permanently disabled for work at his former occupation; maintenance of a temporarily disabled employee's right to reinstatement; and reduction of hazards by the aid of a safety engineer to be employed by the Compensation Commission. The bill was referred to the Committee on Education and Labor.

On December 5 Director VAN H. MANNING of the Bureau of Mines requested an appropriation of $100,000 to conduct an investigation into the ventilation of tunnels and subways for motor vehicles. The Secretary of the Interior also asked for $725,000 for the Bureau of Mines, with which to carry on a fuel inspection service to assure consumers that they get the grade of coal for which they pay.

[1] Preceding report: This JOURNAL 9: 645. 1919.

On December 8 Major General SIBERT, director of the Chemical Warfare Service, appeared before the Senate Finance Committee and argued that the building up of a chemical dyestuffs industry is essential to a complete program of military preparedness.

On November 7 Mr. DUPRÉ of Louisiana requested and received leave to print in the *Congressional Record* an article by Dr. W. B. SMITH, professor of mathematics in Tulane University, entitled "Not ten but twelve," and recently published in *Science*.[2] The article in question discusses the advantage of a duodecimal, as compared with a decimal system of numbers, and the author argues that the English system of weights, measures, coinage, time, etc., which is prevailingly duodecimal in character, should be retained pending the adoption throughout the world of a more perfect number system. The reason for inserting this article in the *Record* was stated to be its bearing on proposed reforms in the coinage system of this and other countries.

The Senate resolution for an investigation of the causes of influenza (S. J. Res. 76) was brought up on the calendar on October 22 and December 8, but was passed over. On October 16 Mr. FRANCE introduced a more comprehensive resolution (S. Con. Res. 13) providing for a survey of all governmental agencies concerned with public health, excepting the Army and Navy organizations. This was reintroduced on October 23, as S. Con. Res. 14, with the A my and Navy exception eliminated. The resolution provides for a joint commission of three members each from Senate and House, "to make a survey of and report on those activities of the several departments, divisions, bureaus, offices, and agencies of the Government of the United States which relate to the protection and promotion of the public health, sanitation, care of the sick and injured, and the collection and dissemination of information relating thereto." The commission is directed to report in June, 1920, on the powers, organization, and coordination of the federal agencies, and their cooperation with non-federal organizations. The resolution was agreed to by the Senate on December 16, and was then referred to the House Committee on Interstate and Foreign Commerce.

The Senate and House adjourned on December 20, until January 5, 1920.

NOTES

A joint meeting of the local sections of the American Society of Civil Engineers and the American Institute of Mining and Metallurgical Engineers was held at the Cosmos Club on Friday, December 19, 1919. The problem of securing closer cooperation among the engineering societies, both in the United States as a whole and in the District of Columbia, was discussed. At the close of the meeting the Civil Engineers met for the annual election of officers. The election resulted as follows: *President*, DAVID S. CARLL; *Vice-President*, JOHN C. HOYT; *Secretary-Treasurer*, JAMES H. VAN WAGENEN.

[2] Science **50**: 239–242. 1919.

Dr. L. A. BAUER gave an illustrated address on *Observations of the total solar eclipse of May 29, 1919, at Cape Palmas, Liberia, and other places*, before the American Academy of Arts and Sciences at Boston, Massachusetts, on January 14.

Dr. WALTER VAN DYKE BINGHAM, director of the division of applied psychology of the Carnegie Institute of Technology, Pittsburgh, has been elected chairman of the division of anthropology and psychology of the National Research Council for the term ending July 1, 1920.

Mr. R. M. DAVIS resigned from the Power Section of the Water Resources Branch, U. S. Geological Survey, in October, to take up work as statistician for the *Electrical World*. He takes the position of Mr. W. B. HEROY, formerly of the Survey, who has entered the employ of the Sinclair Oil Corporation.

Mr. B. E. JONES of the Water Resources Branch, U. S. Geological Survey, returned to Washington on November 7, after spending the season in the St. Mary and Milk River basins in Montana. Mr. Jones and Mr. S. G. DAWSON of the Canadian Reclamation Service, were engaged in the division of the waters of St. Mary and Milk rivers under the direction of the International Joint Commission.

An anniversary publication of the *American Journal of Physical Anthropology* is being planned for March, 1920 in honor of the seventieth birthday of Dr. GEORGE M. KOBER on March 28, 1920.

Mr. R. S. MCBRIDE resigned from the Bureau of Standards on January 15 to accept a position as technical editor with the McGraw-Hill Company of New York City. His headquarters will be in Washington in connection with the Washington office of the company.

Since the return of Mr. EUGENE STEBINGER from private work in the Tampico oil field of Mexico he has been appointed chief of the Foreign Section of the Mineral Resources Branch, U. S. Geological Survey.